Amendments to the Claims:

By the present communication, claims 1, 3, 4, 9, and 13-17 are amended. This listing of claims replaces all prior versions and listings of claims in the application.

Listing of Claims:

1. (Currently Amended) A method of generating a H_2 rich gas from a fuel, comprising:~~ supplying a mixture of molecular oxygen, fuel, and water to a fuel processor; and converting the mixture of molecular oxygen, fuel, and water in the fuel processor to the~~ $\cancel{H_2}$ ~~rich gas, wherein the fuel has the formula~~ $\cancel{C_nH_mO_p}$ ~~where n has a value ranging from 1 to 20 and is the average number of carbon atoms per molecule of the fuel, m has a value ranging from 2 to 42 and is the average number of hydrogen atoms per molecule of the fuel, p has a value ranging from 0 to 12 and is the average number of oxygen atoms per molecule of the fuel, and further wherein the molar ratio of molecular oxygen supplied to the fuel processor per mole of fuel is represented by the symbol x and has a value ranging from about~~ $\cancel{0.5x_0}$ ~~to about~~ $\cancel{1.5x_0}$~~, wherein~~ $\cancel{x_0}$ ~~is equal to~~ $\cancel{0.312n - 0.5p + 0.5(\Delta H_{f,\,fuel}/\Delta H_{f,\,water})}$ ~~where n and p have the values described above,~~ $\cancel{\Delta H_{f,\,fuel}}$ ~~is the heat of formation of the fuel, and~~ $\cancel{\Delta H_{f,\,water}}$ ~~is the heat of formation of water.~~

a. <u>determining a thermoneutral point, x_0, for the fuel prior to or during the production of H_2, wherein</u>

i. <u>the fuel has the formula $C_nH_mO_p$, wherein</u>

(1) <u>n has a value ranging from 1 to 20 and is the average number of carbon atoms per molecule of the fuel,</u>

(2) <u>m has a value ranging from 2 to 42 and is the average number of hydrogen atoms per molecule of the fuel, and</u>

(3) p has a value ranging from 0 to 12 and is the average number of oxygen atoms per molecule of the fuel; and

ii. x_0 is equal to $0.312n - 0.5p + 0.5(\Delta H_{f,\,fuel}/\Delta H_{f,\,water})$, wherein

(1) n and p have the values described above,

(2) $\Delta H_{f,\,fuel}$ is the heat of formation of the fuel, and

(3) $\Delta H_{f,\,water}$ is the heat of formation of water;

b. supplying to a fuel processor a mixture of molecular oxygen, fuel, and water, wherein the molar ratio of molecular oxygen supplied to the fuel processor per mole of fuel is x and has a value ranging from about 0.5 x_0 to about 1.5 x_0, and

c. converting the mixture of molecular oxygen, fuel, and water in the fuel processor to the H_2 rich gas.

2. (Original) The method of claim 1, wherein converting the mixture of molecular oxygen, fuel, and water in the fuel processor to produce the H_2 rich gas further comprises contacting the mixture of molecular oxygen, fuel, and water with a catalyst in the fuel processor to produce the H_2 rich gas.

3. (Currently Amended) The method of claim 1, wherein ~~the molar ratio of molecular oxygen supplied to the fuel processor per mole of fuel is x and~~ x has a value ranging from about x_0 to about $1.5x_0$.

4. (Currently Amended) The method of claim 1, wherein ~~the molar ratio of molecular oxygen supplied to the fuel processor per mole of fuel is x and~~ the molar ratio of water supplied to the fuel processor per mole of fuel is a value ranging from about $0.8(2n - 2x - p)$ to about $2.0(2n - 2x - p)$.

5. (Original) The method of claim 4, wherein the molar ratio of water supplied to the fuel processor per mole of fuel is a value ranging from about $0.9(2n - 2x - p)$ to about $1.5(2n - 2x - p)$.

6. (Original) The method of claim 5, wherein the molar ratio of water supplied to the fuel processor per mole of fuel is a value ranging from about $0.95(2n - 2x - p)$ to about $1.2(2n - 2x - p)$.

7. (Original) The method of claim 6, wherein the molar ratio of water supplied to the fuel processor per mole of fuel is a value ranging from about $1.0(2n - 2x - p)$ to about $1.1(2n - 2x - p)$.

8. (Original) The method of claim 1, wherein the molecular oxygen is supplied to the fuel processor in a mixture of gases comprising N_2 and molecular oxygen.

9. (Currently Amended) The method of claim 1, wherein the ~~mixture of gases comprising N_2 and~~ molecular oxygen is <u>supplied to the fuel processor as</u> air.

10. (Original) The method of claim 1, wherein the fuel is selected from the group consisting of methane, methanol, ethane, ethylene, ethanol, propane, propene, i-propanol, n-propanol, butane, butene, butanol, pentane, pentene, hexane cyclohexane, cyclopentane, benzene, toluene, xylene, natural gas, liquefied petroleum gas, iso-octane, gasoline, kerosene, and diesel.

11. (Original) The method of claim 10, wherein the fuel is selected from the group consisting of methane, natural gas, propane, methanol, ethanol, liquefied petroleum gas, gasoline, kerosene, and diesel.

12. (Original) The method of claim 1, wherein the fuel processor comprises a reforming portion and the H_2 rich gas exiting the reforming portion is maintained at a temperature of from about 100°C to about 900°C.

13. (Currently Amended) The method of ~~claim 1~~claim 1, wherein the fuel processor comprises a reforming portion and the H_2 rich gas exiting the reforming portion is maintained at a temperature of from about 400°C to about 700°C.

14. (Currently Amended) The method of claim 1, wherein ~~the molar ratio of molecular oxygen supplied to the fuel processor per mole of fuel is x and~~ x has a value ranging from about $0.8x_0$ to about $1.4x_0$.

15. (Currently Amended) The method of claim 14, wherein ~~the molar ratio of molecular oxygen supplied to the fuel processor per mole of fuel is x and~~ x has a value ranging from about $0.9x_0$ to about $1.3x_0$.

16. (Currently Amended) The method of claim 15, wherein ~~the molar ratio of molecular oxygen supplied to the fuel processor per mole of fuel is x and~~ x has a value ranging from about $0.95x_0$ to about $1.2x_0$.

17. (Currently Amended) The method of claim 16, wherein ~~the molar ratio of molecular oxygen supplied to the fuel processor per mole of fuel is x and~~ the molar ratio of water supplied to the fuel processor per mole of fuel is a value ranging from about $1.0(2n - 2x - p)$ to about $1.1(2n - 2x - p)$.

18. (Original) The method of claim 2, wherein the catalyst comprises a two part catalyst comprising a transition metal and an oxide-ion conducting portion, and the mixture of

molecular oxygen, fuel, and water is contacted with the catalyst at a temperature of 400°C or greater.

19. (Original) The method of claim 18, wherein the transition metal is selected from the group consisting of platinum, palladium, ruthenium, rhodium, iridium, iron, cobalt, nickel, copper, silver, gold, and mixtures thereof, and the oxide-ion conducting portion of the catalyst is selected from a ceramic oxide from the group crystallizing in the fluorite structure or $LaGaO_3$ or mixtures thereof.

20. (Original) The method of claim 2, wherein the catalyst is selected from the group of autothermally reforming catalysts that operate at a temperature ranging from about 100°C to about 700°C.

21. (Original) The method of claim 2, wherein the H_2 rich gas comprises carbon monoxide and carbon dioxide, and the method further comprises contacting the H_2 rich gas with a second catalyst effective at converting carbon monoxide and water into carbon dioxide and H_2 to produce a second gas further enriched in H_2 and with a reduced level of carbon monoxide.

22. (Original) The method of claim 21, wherein the second catalyst comprises a transition metal on cerium oxide or on ceria doped with a rare earth or an alkaline earth element, further wherein the transition metal is selected from the group consisting of platinum, palladium, nickel, iridium, rhodium, cobalt, copper, gold, ruthenium, iron, silver, and combinations thereof, the rare earth element is selected from the group consisting of gadolinium, samarium, yttrium, lanthanum, praseodymium, and combinations thereof, and the alkaline earth element is selected from the group consisting of magnesium, calcium, strontium, barium, and combinations thereof.